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THE DISTRIBUTION OF EXCHANGE RATES UNDER A MINIMUM EXCHANGE RATE REGIME

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This paper adjusts the Chen and Giovannini (1992) methodology to estimate the unconditional distribution of exchange rates under a one-sided target zone regime, where a central bank commits itself to intervene on foreign exchange markets to prevent its currency to move beyond a previously announced target level vis-à-vis a specific foreign currency. An application of this methodology to the 2011–2015 EUR/CHF minimum exchange rate regime shows that the Swiss National Bank presumably intervened only at (or very close to) the floor level of EUR/CHF 1.20 and not at a level significantly above that boundary. Hence, contrary to previous studies, the reported results accord with the predictions of the Krugman (1991) target zone model about the behavior of exchange rates, allowing investors to gain insights about the central bank's policy function in extraordinary monetary situations and with important consequences for the descriptive validity of theoretical one-sided target zone models.

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I. Introduction

Inspired by the work of Chen and Giovannini (1992) who propose a methodology to estimate the unconditional distribution of exchange rates under

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a symmetric two-sided target zone regime, this paper proposes an adjustment of their methodology such that it can be applied to an asymmetric one-sided, unilateral exchange rate target zone, also called a minimum exchange rate regime.

Specifically, Chen and Giovannini (1992) propose to apply the Box-Cox transformation to a bounded exchange rate (i.e., under a two-sided target zone), a transformation that is based on the system of frequency curves analyzed in Johnson (1949).[1] As a consequence, their approach offers a methodology that allows a wide variety of shapes for the unconditional distribution of bounded exchange rates, making it possible to infer which intervention policies to defend a minimum exchange rate (i.e., intramarginal vs. marginal foreign exchange interventions) are actually more likely being used in practice. From an empirical perspective, the EUR/CHF 1.20 floor, set by the Swiss National Bank (SNB) on September 6, 2011 and finally abandoned on January 15, 2015, provides ample data to analyze the shape of such a distribution.[2] This asymmetric, one-sided, unilateral exchange rate target zone, where the central bank committed itself to intervene on foreign exchange markets to prevent its currency to move beyond a previously announced target level vis-à-vis either a specific foreign currency or a basket of foreign currencies, functioned as a strong-side convertibility commitment.[3]

This episode has important consequences both for the descriptive validity of theoretical exchange rate target zone models and for how to specify the currency risk associated with an investment in a bounded currency (i.e., a long position in a currency under a strong-side convertibility commitment).[4] The target zone model developed by Krugman (1991) or Sutherland (1994), for instance, implies a U-shaped (or bimodal) exchange rate distribution in the case of a two-sided exchange rate target zone (Svensson 1992), since it is assumed that foreign

[1] See, for instance, Sakia (1992) for a review of this transformation technique.

[2] Following the foreign exchange market convention (see Reiswich and Wystup 2010, among others), the exchange rate is referred to as "EUR/CHF" in the body of the text, although the exchange rate is analyzed from a CHF perspective in the empirical section of this paper, i.e., the number of units of Swiss francs needed to buy one euro.

[3] Under the SNB's recently abandoned strong-side convertibility commitment, the SNB promised to buy an unlimited amount of euros to prevent the EUR/CHF exchange rate from moving below the implemented EUR/CHF 1.20 floor level.

[4] In regard to currency risk, any conditional model for the dynamics of a given asset return series must be in accordance with its unconditional distribution of asset returns (Mittnik et al. 1998).